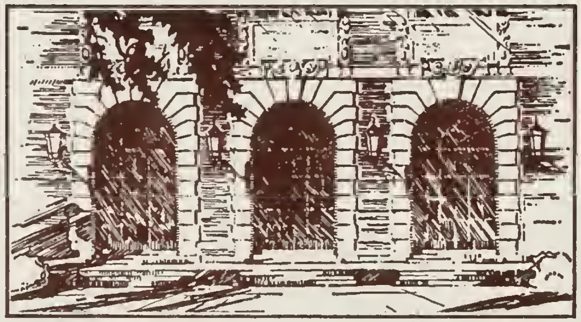

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Dyslexia in Young Children. A Factorial Study, with Special Reference to the Illinois Test of Psycholinguistic Abilities

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The data whose analysis is described in the present paper were obtained during the course of experiments which were carried out in Brisbane, Australia. These experiments were designed to compare the performance of 23 dyslexic children on several psychological and psycholinguistic tests with that of a similar number of controls.

In the present paper, the original experiments are briefly described, the findings summarised and there then follows a factor analysis of the data which was carried out with the facilities of the SSUPAC program of the Statistical Services Unit of the University of Illinois.[1]

Situational Background of the Research

In some quarters, there is still dispute as to whether there exists an identifiable sub-group of backward readers who may legitimately be termed "dyslexic" (Vernon 1965), while it is clear from the published writings of those workers who accept the concept of dyslexia that its symptoms are not invariant and unidimensional. Myklebust and Johnson (1962), for instance, point out that "it should not be construed that all facets of this syndrome of childhood dyslexia will be present in a given child", while Rabinovitch (1959) ascribed to children with what he terms _primary reading retardation_ "a characteristic pattern with much variability from patient to patient". From the clinical reports of workers in the field, a "characteristic pattern" _can_ be sensed, even

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though the pattern is blurred by "much variability from patient to patient". One approach toward a deeper understanding of the nature of dyslexia is to examine the characteristics of group of backward readers where there is a reasonable probability that the reading disability does not result from exogenous causes and which can, therefore, describe with some confidence as "dyslexia-enriched".

Brisbane appears to be an eminently suitable location for such an inquiry. Surveys which were carried out in 1965 at the Grade Two and Grade Four levels, indicated that the incidence of reading retardation in the metropolitan area is remarkably low. For instance, the survey of Grade Four children showed that in a representative sample of approximately 400 children, only about three and a quarter per cent had reading quotients of 80 or less, compared with at least 21 to 25 per cent in Britain (Ministry of Education 1957). In the Grade Two survey, the reading performance of Brisbane children was compared with that of children in the English i.t.a. experiment (Downing 1964). The Neale Analysis of Reading was administered to a representative sample, again consisting of some 400 Brisbane children under exactly the same conditions as those in the English experiment. It can be observed from Table 1 that every Brisbane child who was examined achieved some score on the test, whereas 38.95 per cent of the English control group and 14.45 of the English i.t.a. group failed to score. Furthermore, while two-thirds of the English control group and nearly a third of the English i.t.a. group scored 10 or fewer, the corresponding incidence in Brisbane was less than six per cent.

Table 1

Reading accuracy of Brisbane children and children in the English i.t.a. experiment, after $1\frac{1}{2}$ years in school.

Neale Test Score	Percentage of children: English i.t.a.	English t.o.	Brisbane
0	14.45	38.95	0.0
1-10	17.8	28.4	5.7
11-20	11.65	16.85	31.0
21-30	26.7	9.45	46.1
31-40	13.0	3.7	10.2
41-50	8.2	1.05	3.9
51-60	6.15	1.6	3.1
61-	2.05	0.0	0.0

If dyslexia is a function, or a partial function, of neurological or genetic factors, it would be reasonable to expect that its incidence should be relatively constant from culture to culture, at any rate in English-speaking communities. On the basis of probability alone therefore, the chances of a case of reading failure in Brisbane being dyslexic ought to be greater than in places where the incidence of reading failure is several times higher. If, in addition, attention is confined to those children in respect of whom there are no detectable exogenous factors which might account for their reading failure, confidence that the group's reading disability is of a more inherent nature is reinforced.

The Grade Two Study of Dyslexia

The selection of the dyslexic group and controls, and the experimental materials and procedure have been fully described elsewhere (McLeod 1967). The [redacted] tests which were administered, are set out in Table 2 of the Appendix to the present article. The Dyslexia Schedule referred to is a questionnaire that had been developed at the Remedial Education Centre of the University of Queensland (McLeod 1968). In an earlier validatory study, a number of its items had been shown to discriminate significantly between children who had been referred to the Centre on account of reading disability, and controls. The items which discriminated significantly are set out in the appendix to this paper. In the experiment under discussion, the number of adverse responses to these critical items was termed the child's AR score.

Summary of Experimental Findings

1. In the Wechsler Intelligence Scale for Children, the Information and Digit Span sub-tests differentiated significantly between the two groups ($p = .01$) in favour of the control group after adjustment had been made for Full Scale I.Q. Arithmetic discriminated in favour of the control group at the .05 level of confidence. The Coding test too discriminated at the .05 level, but in favour of the dyslexic group. This result appears at first glance to run counter to those of a number of other researches, including one by the present author (McLeod 1965). However, the children who were concerned in the present experiment were only seven years old, and therefore had been given the WISC Coding Form A, which has five geometrical symbols. All the experiments in which Coding has been found to discriminate in favour of non-retarded readers have been concerned with older children who have completed the Coding Form B, which has nine geometrical symbols and associated digits. It seems therefore that the relationship to reading disability of skills which are tapped by tests such as WISC Coding depends upon the number and/or type of symbols, and upon the chronological age of the child. If, for instance, the dyslexic child may be though of as a communication channel capable of processing more than five signs in a Coding-type task, but incapable of processing nine signs (Miller's "magic number seven, plus or minus two"?), then the apparent inconsistency of experimental results can be reconciled. Exploration of this phenomenon is beyond the immediate scope of the present study, but is one that will probably repay further research.

2. The Illinois Test of Psycholinguistic Abilities discriminated significantly ($p = .01$) between the dyslexic and control groups, over and above the WISC. That is, there was still a significant difference between the two groups' scores on the ITPA after adjustment had been made for differences in I.Q.

3. Within the ITPA itself, the Auditory-Vocal Automatic, the Auditory-Vocal Sequential and the Auditory Decoding tests discriminated in favour of the control group, and Motor Encoding discriminated in favour of the dyslexic group, after adjustment had been made for the difference between the two groups on overall ITPA Language Age. Because of a significant heterogeneity of variance of the groups' scores on the Visual-Motor Sequential test, data on this test could not validly be analysed.

4. The dyslexic group was consistently inferior in reproducing visual letter sequences at all levels of approximation to English. That is, their inferiority was neither more nor less marked when zero-order approximations to English words were displayed than when second-order approximation words were used.

5. The Wepman test discriminated significantly ($p = .001$) between the dyslexic and control groups, but the N.U.4 Auditory Test did not, suggesting a weakness on the part of the dyslexics in the perception of phonemes. An alternative, but equivalent, way of expressing this interpretation would be to say that the dyslexics exploited redundancy within a word to a relatively greater extend than did the controls.

6. The dyslexic group was significantly inferior in their vocal reproduction of words that had been auditorily presented in context.

This was true for both first- and for third-order contexts. However, the deficiency was significantly less marked in the case of words that were preceded by third-order context, suggesting that the dyslexics took advantage of redundancy between spoken words, or conversely, that the dyslexics' performance deteriorated as the information rate of the material increased. As their deficiency in auditory-vocal processing of spoken language signals had been particularly pronounced when redundancy between and within words was minimal, the dyslexic group's performance on the auditory perception tests was as if they were acting like communication channels of particularly limited capacity.

7. Defining each child's AR score on the Dyslexia Schedule as the number of adverse responses to items which the earlier validatory study had shown to be effective discriminators, twenty of the 23 members of the dyslexic group received an AR score of six or higher, whereas only a single child of the control group attracted such a high AR score.

Factorial Analysis of Data

Summary of the Analytical Design

In the course of the experimental studies, 29 separate quantitative assessments had been recorded for each of the 46 children in the investigation. Product-moment correlations between the 29 variables were computed and these were factor analysed. No definitive test data were included in the correlational matrix; that is, no data such as reading ages which had been used as one of the criteria to determine whether or not a child should be included in the dyslexic group. The 29 tests are listed in Table 2 (Appendix).

Principal Axis factor analysis was employed, and factors were extracted until the criterion of eigen value equal to unity was reached. The element of largest absolute magnitude in each row was used for the estimation of communalities and the principal axis factors were subjected to Varimax rotation, thus yielding an orthogonal solution.

The factor scores of each of the 46 children on the rotated factors were computed and these factor scores were then used in order to predict whether a child belonged to the dyslexic group or the the control group. Prediction was achieved by multiple regression, the scores on the rotated factors being the independent predictive variables.

The multiple regression equation was built up stepwise, introducing the independent variables (i.e. rotated factors) one at a time. The most significant factor was identified first and correlated with the criterion, then other factors were introduced one by one in order of the significance of their correlation with the criterion until no further significant gain accrued in the multiple correlation coefficient.

Results

The matrix of intercorrelations between the 29 tests are set out in Table 6 in the Appendix. The factor analysis proceeded until an eigen value of unity was reached, at which stage five factors had been extracted, accounting for 62.00 per cent of the variance. The variance accounted for by each of the unrotated factors is recorded in Table 7 of the Appendix.

Table 3 depicts the rotated factor matrix with all loadings deleted whose rounded absolute value is less than 0.4. The actual values of factor loadings higher than a rounded 0.6 are reproduced to two places of decimals; loadings which are at least 0.5 are represented by a single plus sign and loadings of 0.4 or higher by a plus sign in parentheses.

Interpretation of Factors

All the Automatic-Sequential level tests of the ITPA have significant loadings on Factor 1 and the test which has the heaviest loading is the WISC Digit Span. The reproduction of tachistoscopically presented letter sequences also has a heavy loading on this factor, which is interpreted as a Sequencing-Integrative factor.

The factor is characterised by skills at the integrative level of the Osgood (1957a) theoretical model, where response is a function of frequency and contiguity, rather than a consequence of representational or semantic mediation. Sequencing has been specifically emphasised in the labelling of this factor because of the particularly heavy loadings of tests where the response involved some sequential element. [redacted]

Two tests which loaded moderately on Factor 1 and which might appear to be representational in nature rather than integrative are the ITPA Auditory-Vocal Association test and the WISC Information test.

However, many of the responses to the Auditory-Vocal Association test are such as might be expected to be elicited spontaneously, for example in a word association test, by the operative word in the initial sentence. Comprehension of the whole item "Soup is hot; icecream is ___?" is, to some extent at any rate, unnecessary. The stimulus "hot" alone would have been sufficient to arouse the response "cold", as has been confirmed informally on many occasions in the clinical training situation. Similarly, items in the WISC Information test which require the number of days in a week or pounds in a ton, the discoverer of America or the capital of Greece, etc., call for responses that are of a rote nature in that they have been frequently associated and do not solely depend upon cognitive synthesis.

The tests which had loadings on Factor 2 were the ITPA Visual Decoding, Motor Encoding, Vocal Encoding, WISC Similarities, Vocabulary and, to a smaller extent, Information. Each of these five tests are characterised by being response-oriented; that is, they require the subject to have a prior mental set which is vocally or sub-vocally mediated. In the case of Similarities, which had the heaviest loading on Factor 2, the subject awaits the two stimulus words with the preceding directive of "How alike?". With Vocal Encoding, he is prepared to "tell all about this", his response being elicited by the presentation of the stimulus object. Again, in the Vocabulary test, he awaits the stimulus word to trigger off a response that has been oriented toward "telling the meaning of ...". As Osgood (1957) has described intention (s_m) as the essential characteristic of the encoding process, and has further defined encoding as "the association of mediated self-stimulation with overt instrumental sequences", it seems reasonable to regard Factor 2 as an Encoding Factor. It might be noted incidentally that Comprehension and Arithmetic of the WISC Verbal Scale, where there is no preliminary set by the subject, do not load on this factor.

The loading of the ITPA Visual Decoding on Factor 2 appears to pose a problem, but perhaps the nomenclature of this test is misleading. The relationship between Visual Decoding and encoding tests is not a finding unique to the present study. McCarthy and Kirk (1963, p.61) themselves report that in their statistical analysis of the ITPA standardization data, "half the correlations between Motor Encoding and Visual Decoding are significantly different from zero", and for their seven-year-old sample, Vocal Encoding, Motor Encoding and Visual Decoding were the three tests which loaded significantly on the second factor of their analysis, the factor being interpreted as Encoding.

The test procedure which is followed in the Visual Decoding test is that the subject is first shown a single illustration of, say, a table. Then he is shown a page which contained four illustrations and he is required to "find one there". It is conceivable that the child examines each picture in turn, assesses their respective similarities to the previously presented picture, and selects the most appropriate. Observation of children in the actual test situation however suggests that after an initial visual decoding of the first picture, they are again response-oriented when they examine the second card and that they approach the pictures looking for "tableness".

Although nominally a test of decoding skill, therefore, it is plausible to argue that there is, as the factor analysis suggests, a substantial element of encoding involved also.

Block Design, Object Assembly and Picture Completion from the WISC, and Visual-Motor with smaller loadings on the WISC Picture Arrangement, ITPA Motor Encoding and Visual-Motor Association, constituted the tests which identified Factor 3. This was termed a Visual-Motor factor.

The tests which loaded significantly on the fourth factor were those which involved the reproduction of, or discrimination between, auditorily presented words, and the ITPA Auditory Decoding. Moreover, although it is doubtful how much significance should be attached to the fact, the loadings of the tests which involved less redundant stimuli were greater than those of tests whose stimuli were more redundant. That is, the Wepman test loaded more heavily than did the N.U.4 test, and of the tests requiring the vocal reproduction of auditorily presented words in context, the first-order context test loaded more heavily than did the third-order context, while the Auditory Decoding test, which involves highly redundant material, had the least of the significant loadings. Factor 4 was therefore interpreted as an Auditory Language Input Capacity factor, the word "capacity" being included because of the heavier loadings of the tests whose items had a higher information rate.

Arithmetic, Mazes and to a lesser extent Comprehension, all from the WISC, loaded on Factor 5. Each of these tests requires some degree of planning ahead, of anticipating the consequences of particular responses or chain of responses, or, in the language of the Osgood model, a multi-stage mediational process. Factor 5 was designated a Planning factor.

In summary, the five rotated factors were interpreted as follows:

1. Sequencing-Integrative.
2. Vocal Encoding.
3. Visual-Motor.
4. Auditory Language Input Capacity.
5. Planning.

Derivation of Multiple Regression Equation

Each child's factor scores on the five rotated orthogonal factors were computed. The five factors were then treated as independent variables from which, through multiple regression, was to be predicted whether the child was a member of the dyslexic or control group. As a criterion, or dependent variable, each member of the dyslexic group was arbitrarily assigned a score of 1.0 and each member of the control group a score of 2.0. Factors were entered in to the multiple regression equation until no further significant improvement in multiple correlation was achieved. The criterion for a variable to be entered in the multiple regression equation was that it should have an F value of more than 2.0. The factors which were found to contribute significantly to the multiple regression, listed in the order in which they were entered, are shown in Table 4, together with the coefficient of multiple correlation between the criterion and the weighted factors as they had been included in the regression equation.

Table 4

Factors included in regression equation to predict membership of dyslexic or control group

Factor No.	Factor Name	Cumulative Multiple correlation with criterion
1.	Sequencing-Integrative	0.622
4.	Auditory Language Input Capacity	0.791
2.	Encoding	0.820
5.	Planning	0.845

Table 5 records the standardised regression coefficients of each factor, together with their respective t-ratios. Standard errors of the coefficients were of the order of 0.08.

Table 5

Standardised regression coefficients

Factor	Standardised regression coefficient	t-ratio
Sequencing-Integrative (1)	0.586	7.006
Auditory Language Input Capacity (4)	0.483	5.776
Encoding (2)	0.215	2.577
Planning (5)	0.204	2.436

Discussion of Results

The results of the present factorial study reinforce, in a single consolidated analysis, the general picture which had been synthesised from the separate experiments from which the data had been gathered. For example, the experimental approach had indicated the greater sensitivity of the ITPA, compared with the WISC, in discriminating dyslexics; the importance within the ITPA of the Automatic-Sequential tests; and the relative competence of dyslexics on the WISC Coding and IPTA Motor Encoding tests. These findings were reflected in the factorial study in that the most significant factor which emerged had substantial loadings on four of the nine ITPA sub-tests but only two - both verbal - of the twelve WISC sub-tests. Of the four ITPA sub-tests which loaded on this factor, all three Automatic-Sequential level tests were in evidence, while one of the WISC sub-tests was the Digit Span.

The significance of the Dyslexia Schedule and of the tests which involved the reproduction of tachistoscopically presented letter sequences, and the reproduction or discrimination of auditorily presented words, had emerged from the experimental studies. These findings were parallelled in the factorial analysis where all of the measures were found to have substantial loadings on one or both of the two most significant factors in the regression equation.

As far as the sample of seven-year-old children used in the present study is concerned, it would appear that severe reading disability can be inferred - and, hopefully, predicted - from measurable correlates, with a satisfactorily high degree of reliability. What might be somewhat surprising is the factorial nature of these correlates. Examination of Table 4 reveals that a multiple correlation coefficient of 0.791 was achieved by Factors 1 and 4, both of which involve integrative or automatic-sequential level skills only. Further, there was no factor in the final regression equation which could be linked <u>specifically</u> with visual perception.

Conclusions

The ITPA Model

The present analysis affords some support for the validity of the sub-tests of the ITPA and of the theoretical model on which the test is based.

The ITPA sub-tests loaded on four factors that were definable by reference to tests other than those of the ITPA itself.

Of the four factors, the first supported the theoretical and clinical postulate of an automatic-sequential level of perceptual organization which involves skills that transcend sense modality, are pertinent to psycholinguistic behaviour, and yet whose characteristics are distinctive from cognitive skills where semantic mediation and meaningful manipulation of verbal concepts are predominant. Factors 2 and 4 lent support to the ITPA's classification of decoding and encoding processes, while Factor 3 was consistent with the classification according to psycholinguistic modal channel.

Psycholinguistic Correlates of Severe Reading Disability

From the present investigation, there would appear to be grounds for some optimism that severe reading disability can be inferred with a fair amount of accuracy from the assessment of correlated skills such as those measured in the experiments which underlie the analysis.

In particular, more than a half of the total variance was accounted for by the two factors which were shown to have the most significant regression coefficients in the multiple regression equation. The first of these factors was associated with automatic-sequential or integrative skills which involved both visual and auditory input. The second factor was associated with the discrimination between, and vocal reproduction of, auditorily presented words, and which therefore appears to be related to auditory receptivity.

The findings thus provide still further support for the numerous researches, summarised by Bateman (1965), which have reported weaknesses in the automatic-sequential area in children who have learning disabilities.

Diagnosis of Dyslexia

The ideal at which to aim in the treatment of dyslexia is to predict those children who are "dyslexia-prone", rather than to confirm that a child presents certain characteristic symptoms after severe reading disability has manifested itself.

The present study indicates that more attention needs to be focused on skills at the automatic-sequential level of perceptual organization if accurate prognosis is to be achieved rather than tc reply almost exclusively on measures of general mental development and visual perception as has so often been the case in the past. As a screening device, an instrument such as the Dyslexia Schedule appears to hold some promise of value. Being composed of items which are based on symptoms which are observable in the pre-school child, it can be completed by parents and does not require any prolonged individual testing. The Dyslexia Schedule had a substantial loading on the first, predominant factor in the multiple regression equation and a smaller, but significant, loading on the fourth factor. Thus the Dyslexia Schedule achieved loadings on the two factors that had the most significant predictive coefficients.

References

Bateman, Barbara D. The Illinois Test of Psycholinguistic Abilities in Current Research. Urbana, Illinois. Institute for Research on Exceptional Children, 1965.

Downing, J.A. The i.t.a. Reading Experiment. London, Evans Bros., 1964.

McCarthy, J.J. and Kirk, S.A. The Construction, Standardisation and Statistical Characteristics of the Illinois Test of Psycholinguistic Abilities. Madison, Wisconsin. Photopress Inc., 1963.

McLeod, J. A Comparison of WISC Sub-test Scores of Pre-adolescent Successful and Unsuccessful Readers. Austral. J. Psychol. 1965, 17, 3, 220-228.

McLeod, J. Prediction of Childhood Dyslexia. Slow Learning Child, 1966, 12, 3, 143-154.

McLeod, J. The Perceptual Bases of Reading. Proceedings of the First International Congress on Reading, Paris 1966. Newark, Delaware, International Reading Association. (1966a)

McLeod, J. Some Psycholinguistic Correlates of Reading Disability in Young Children. Reading Res. Quart. 1967, 2, 3, 5-32.

McLeod, J. Dyslexia Schedule, School Entrance Check List and Manual. Educators Publishing Service. Cambridge, Mass. 1968.

Miller, G.A., Bruner, J.S. and Postman, L. Familiarity of Letter Sequences and Tachistoscopic Identification. J. General Psychol. 1954, 50, 129-139.

Miller, G.A., Heise, G.A. and Lichten, W. The Intelligibility of Speech as a Function of the Context of the Test Materials. J. Exp. Psychol. 1951, 41, 329-335.

Miller, G.A. and Selfridge, J.A. Verbal Context and the Recall of Meaningful Material. Amer. J. Psychol. 1950, 63, 176-185.

Ministry of Education. Standards of Reading. London, H.M.S.O., 1957.

Myklebust, H. and Johnson, Doris. Dyslexia in Children. Exceptional Children, 1962, 29, 1, 14-26.

Neale, Marie D. Neale Analysis of Reading Ability. London, Macmillan, 1958.

Osgood, C.E. A behavioristic Analysis of Perception and Language as Cognitive Phenomena, 1957. (In Contemporary Approaches to Cognition; The Colorado Symposium. Cambridge, Mass., Harvard Univ. Press, 1957).

Osgood, C.E. Motivational Dynamics of Language Behavior, 1957a. (In Nebraska Symposium on Motivation. Lincoln, Univ. of Nebraska Press, 1957.)

Rabinovitch, R. Reading and Learning Disabilities. Amer. Handbook Psychiat., N.Y. Basic Books, 1959, 857-869.

Radford, W.C. A Word List for Australian Schools. Melbourne, A.C.E.R., 1960.

Southgate, Vera. Southgate Group Reading Tests. London, U.L.P., 1959.

Stowe, A.N., Harris, W.P. and Hampton, D.B. Signal and Context Components of Word-Recognition Behaviour. J. Acoust. Soc. Amer. 1963, 35, 5, 639-644.

Thorndike, E.L. and Lorge, I. The Teacher's Word Book of 30,000 Words. N.Y. Bureau of Publications, Teachers' College, Columbia University, 1964.

Tillman, T., Carhart, R. and Wilber, Laura. A Test for Speech Discrimination Composed of CNC Monosyllabic Words (N.U. Auditory Test No. 4). U.S. Dept. of Commerce, Office of Tech. Services, 1963.

Vernon, M.S. Specific Dyslexia. The Slow Learning Child. 1965, 12, 2, 71-75.

Voelker, C.H. The One-Thousand Most Frequent-Spoken Words. Quart. J. Speech, 1942, 28, 189-197.

Wepman, J.M. Auditory Discrimination Test. J.M. Wepman, 950 E. 59th St., Chicago 37, 1958.

Appendix

Table 2

Test variables included in factor analysis

	Name of test	Abbreviation
1.	ITPA Auditory-Vocal Automatic	AVAut
2.	Visual Decoding	VD
3.	Motor Encoding	ME
4.	Auditory-Vocal Association	AVAss
5.	Visual-Motor Sequential	VMS
6.	Vocal Encoding	VE
7.	Auditory-Vocal Sequential	AVS
8.	Visual-Motor Association	VMA
9.	Auditory Decoding	AD
10.	WISC Information	I
11.	Comprehension	C
12.	Arithmetic	A
13.	Similarities	S
14.	Vocabulary	V
15.	Digit Span	D
16.	Picture Completion	PC
17.	Picture Arrangement	PA
18.	Block Design	BD
19.	Object Assembly	OA
20.	Coding	CO
21.	Mazes	MZ
22.	Tachistoscopic Letter Sequences (Zero-order)	TLS(0)
23.	Tachistoscopic Letter Sequences (2nd-order)	TLS(2)
24.	Words in spoken context (1st order)	WiC(1)
25.	Words in spoken context (3rd order)	WiC(3)
26.	Wepman Test in Phonemic Discrimination	WEP
27.	N.U.4 Auditory Test	NU4
28.	Dyslexia Schedule Adverse Responses	DSAR
29.	Chronological Age	CA

Table 3

Rotated factor loadings

Test	Factors 1	2	3	4	5
AVAut	.70				
VD		.58			
ME		.55	(+)		
AVAss	.61	(+)			
VMS	.58				
VE		+			
AVS	.78				
VMA			+		
AD				(+)	
I	.59	+			
C		+			(+)
A	(+)				.56
S		.66			
V		.61			
D	.84				
PC			.61		
PA	+		(+)		
BD			.75		
OA			.66		
CO					(+)
MZ					.63
TLS(0)	.80				
TLS(2)	.73				
WiC(1)				.73	
WiC(3)				.69	
WEP				.57	
NU4		(+)		+	
DSAR	+			(+)	
CA					

Table 6

Test intercorrelations (decimal points omitted)

Test No.	Title	1	2	3	4	5	6	7	8	9	10
1	AVAut	1000									
2	VD	371	1000								
3	ME	152	498	1000							
4	AVAss	660	340	362	1000						
5	VMS	512	408	277	482	1000					
6	VE	447	520	259	290	294	1000				
7	AVS	510	166	301	528	471	182	1000			
8	VMA	112	153	266	117	228	260	166	1000		
9	AD	242	167	-004	152	211	080	028	007	1000	
10	I	520	458	295	579	605	427	454	153	154	1000
11	C	095	316	337	162	239	207	055	221	045	364
12	A	358	337	098	281	456	272	454	170	159	470
13	S	427	454	370	415	230	462	266	361	065	489
14	V	350	458	272	294	416	497	352	398	070	577
15	D	635	252	194	509	612	267	799	268	126	586
16	PC	264	230	177	281	268	249	157	236	216	155
17	PA	309	412	379	513	341	412	446	287	089	464
18	BD	148	283	385	298	425	170	044	330	255	254
19	OA	307	235	490	272	298	197	244	512	109	254
20	CO	-135	211	294	061	226	-051	074	-161	-287	147
21	MZ	230	198	078	092	451	108	315	141	040	229
22	TLS(0)	686	386	197	565	596	334	627	335	218	547
23	TLS(2)	526	333	070	452	555	311	556	295	271	561
24	WiC(1)	368	248	-103	258	049	206	194	086	186	149
25	WiC(3)	178	049	-360	044	043	-016	065	-168	326	044
26	WEP	275	089	042	235	221	227	284	165	092	353
27	NU4	106	225	083	202	067	147	020	014	199	100
28	DSAR	599	394	125	529	388	314	425	182	295	566
29	CA	-037	040	348	197	-066	-093	-096	044	-070	-179

Table 6 (cont.)

Test No.	Test Title	11	12	13	14	15	16	17	18	19	20
11	C	1000									
12	A	380	1000								
13	S	250	214	1000							
14	V	412	425	598	1000						
15	D	018	468	325	378	1000					
16	PC	-076	088	115	122	368	1000				
17	PA	156	357	365	384	438	477	1000			
18	BD	314	257	062	258	268	516	462	1000		
19	OA	263	216	286	254	344	347	373	549	1000	
20	CO	262	209	-066	109	-112	-076	184	017	-092	1000
21	MZ	334	442	-019	220	352	196	336	416	329	219
22	TLS(0)	189	444	410	504	699	355	540	298	265	009
23	TLS(2)	166	515	307	439	662	367	550	380	194	-059
24	WiC(1)	072	230	145	213	293	057	141	068	193	-324
25	WiC(3)	-082	025	-117	027	170	-028	-174	-175	-225	-077
26	WEP	221	105	188	382	331	-171	199	157	270	-162
27	NU4	352	268	185	142	-097	-214	085	089	148	-030
28	DSAR	199	418	371	282	494	005	409	175	151	-155
29	CA	-181	-460	045	-068	-137	024	-054	035	086	-134

Test No.	Test Title	21	22	23	24	25	26	27	28	29
21	MZ	1000								
22	TLS(0)	344	1000							
23	TLS(2)	455	840	1000						
24	WiC(1)	257	304	372	1000					
25	WiC(3)	153	076	178	543	1000				
26	WEP	296	265	305	507	445	1000			
27	NU4	289	035	114	427	276	417	1000		
28	DSAR	275	556	606	432	248	368	291	1000	
29	CA	-408	-006	-180	060	-138	-120	-093	-070	1000

Table 7

Variance accounted for by unrotated
principal axis factors

Factor	Variance	Per cent variance
1	8.95	30.85
2	2.94	10.15
3	2.19	7.57
4	2.05	7.07
5	1.84	6.36
		62.00

Table 8

Varimax rotated factor matrix

Test	Factors (decimal points omitted) 1	2	3	4	5
AVAut	.6978	.2587	.0775	.2842	-.0689
VD	.2572	.5817	.1960	.0522	.0854
ME	.1061	.5506	.3902	-.2787	-.0973
AVAss	.6072	.3729	.1606	.1091	-.1372
VMS	.5814	.2239	.2678	-.0210	.3014
VE	.2826	.5068	.1397	.1126	-.0068
AVS	.7772	.1157	.0164	-.0043	.1335
VMA	.1152	.2727	.4823	.0462	-.0326
AD	.1462	-.0567	.2029	.3825	.0034
I	.5892	.4829	.0539	.0466	.2173
C	-.0566	.5153	.1539	.0208	.4299
A	.4154	.2406	.0869	.0659	.5614
S	.3222	.6551	.0671	.0500	-.1694
V	.3414	.6064	.1120	.0556	.1868
D	.8434	.0345	.2125	.1383	.0966
PC	.3347	-.1252	.6145	-.0579	-.0949
PA	.4620	.3069	.4313	-.0566	.1245
BD	.1113	.1379	.7543	.0316	.2028
OA	.1062	.2936	.6631	.0859	.0218
CO	-.0004	.1972	-.0771	-.4957	.3771
MZ	.2167	.0365	.3049	.1736	.6271
TLS(0)	.7977	.2056	.2435	.1428	.0868
TLS(2)	.7262	.0817	.2735	.2704	.2718
WiC(1)	.1818	.1427	.0483	.7281	.0170
WiC(3)	.1120	-.1600	-.2364	.6910	.0942
WEP	.1525	.2839	.0144	.5674	.1838
NU4	-.1438	.3737	-.0160	.4835	.2697
DSAR	.5361	.3180	.0136	.4182	.0955
CA	-.0886	.1228	.1373	-.0550	-.6302

Dyslexia Schedule

List of items discriminating dyslexic children

1. (a) Have you ever suspected that S may have defective eyesight?
   (b) If so, has S ever been seen by an optometrist or by an eye specialist?
   (c) (If yes) What was the result of the examination?
   (AR : n.a.d.)

2. (a) Have you ever suspected that S may have defective hearing?
   (b) If so, has S ever had his hearing tested?
   (c) (If yes) What was the result of the examination?
   (AR : n.a.d.)

3. Was S ever in hospital <u>at all</u> before he was 3 years old? (AR : yes)

4. If S has been separated at all from one or both parents, did he seem different in any way after separation? (e.g. more clinging, affectionate, indifferent to parents). (AR : yes)

5. Has S any nervous tendencies?
   (a) bedwetting (AR : yes)
   (b) excessive story-telling (lies or fantasy) (AR : yes)
   (c) fear of dark (AR : yes)
   (d) fear of making mistakes. (AR : yes)

6. Does S show anxiety and/or depression? (AR : yes)

7. Is S over-active? (AR : yes)

8. Was S over-active in infancy? (AR : yes)

9. Was S over-active before he was born? (AR : yes)

10. Does S vary rapidly between moods? (e.g. from timidity to aggressiveness) (AR : yes)

11. At what age did S speak? (Apart from "da" and "ma")
    (AR : 24 months +)

12. At what age was S's speech (i.e. 2 or more continuous words) intelligible to persons <u>other than mother</u>?
    (AR : 30 months +)

13. Was S's talk still immature at age 4 or 5, i.e. at or just prior to commencing school? (e.g. "fink" for "think", "dat" for "that", reference to himself by name rather than by "I" or "me".)
    (AR : yes)

14. Has S ever tended to mix up the order of words in a sentence or to mix up parts of words? (e.g. "flutterby" for "butterfly", or "hopgrasser" for "grasshopper", "Did you lawn the mow" for "Did you mow the lawn?" etc.) (AR : yes)

15. (a) Can S write his name?
    (b) If so, does he jumble or reverse any letters? (AR : yes)

16. Has S had any difficulty in distinguishing right from left? (e.g. in following directions, performing actions involving turning handles to right or left, etc.) (AR : yes)

17. Have any members of S's family experienced difficulties with reading and/or spelling? (AR : Mother, Father, Grandparent, or sibling)

(Only 1 counted)